NEWS RELEASE

EneCoat Technologies

Jan. 17, 2025

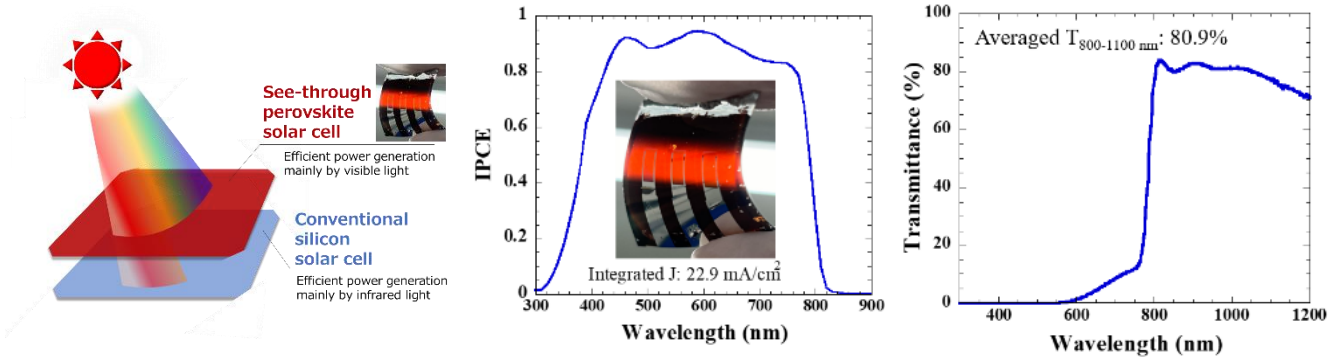
# Achieved a conversion efficiency of over 30% with a perovskite/silicon 4-terminal tandem solar cell.

EneCoat Technologies Co., Ltd (Head Office: Kumiyama-cho, Kuze-gun, Kyoto; President: Naoya Kato) has achieved a conversion efficiency of over 30% with a 4-terminal tandem cell consisting of stacked perovskite and crystalline silicon solar cells in a joint development project with Toyota Motor Corporation. Ltd.

This achievement underscores the profound research and development capabilities of both companies in the field of perovskite solar cells and accelerates the practical application of high-efficiency solar cells, which is the objective of the joint development project.

Solar cells used in automobiles, satellites, and other applications are required to have the highest possible conversion efficiency due to the limited area available for their installation. While the theoretical conversion efficiency of perovskite solar cells alone is 33.7%, the theoretical conversion efficiency of tandem-type solar cells, which are made by stacking perovskite solar cells and crystalline silicon solar cells, is 43.8%, far exceeding the value of standalone solar cells.

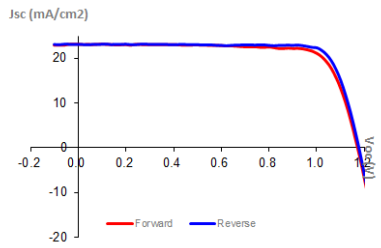
Tandem solar cells have a structure with a perovskite solar cell and a crystalline silicon solar cell, each of which has its own power generation layer, in order from the light-receiving side. The perovskite solar cell first generates power with light energy in the visible light region, and the crystalline silicon solar cell generates power with light energy in the infrared region, which is not absorbed by the perovskite. The perovskite solar cell is the first to generate electricity. Therefore, perovskite solar cells are required to have both high power generation capability in visible light and the ability to transmit infrared light to crystalline silicon without loss. This time, the two companies focused on the transmittance of perovskite solar cells and succeeded in improving the infrared transmittance to 81%.



When solar cells are installed on the roof of an automobile, they are required to follow the roof shape. The two companies developed a film-type perovskite solar cell and achieved a conversion efficiency of 22.4%, which is extremely high for a see-through type solar cell. 22.4% conversion efficiency and 81% infrared transmittance have never been reported before in the world, proving the superior technology of the two companies. By combining this film-type perovskite solar cell with a crystalline silicon solar cell, we have achieved a world-class conversion efficiency of 30.4% as a 4-terminal tandem solar cell.

The conversion efficiency values obtained in this development were measured in a small area at the cell level, and we will continue to develop the large size modules of solar cells to achieve the practical application of high efficiency solar cells that will bring benefits to users.

The results will be presented at The Asia-Pacific International Conference on Perovskite, Organic Photovoltaics and Optoelectronics ( IPEROP25), which will be held on January 21 and 22, 2025, at Kyoto University's Uji Campus.




| | Area ($cm^2$) | Jsc ($mA/cm^2$) | Voc (V) | FF | PCE (%) |
|---|---|---|---|---|---|
| See-through perovskite solar cell | 0.1 | 23.1 | 1.18 | 0.82 | 22.40 |
| Silicon solar cell (Filtered with perovskite solar cell) | 4 | 16.3 | 0.69 | 0.71 | 8.0 |
| 4-terminal tandem solar cell | | | | | 30.4 |
| ※silicon solar cell | 4 | 37.7 | 0.71 | 0.67 | 17.7 |

About EneCoat Technologies

Enecoat Technologies is a startup company established in January 2018,based on the research results of Atsushi Wakamiya's laboratory at the Institute for Chemical Research, Kyoto University. The company's corporate mission is to contribute to the realization of a carbon-neutral society through the development of lightweight thin-film solar cells for high-illumination (outdoor) applications.

The development of solar cells for automotive applications is part of the aforementioned (2) contribution to the realization of a carbon-neutral society through lightweight thin-film solar cells for high-illumination (outdoor) applications, and we are committed to realizing a rich automotive lifestyle and reducing CO2 emissions in the automobile sector.

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Capital ：JPY 90 million
Business: Development, manufacture and sales of perovskite solar cells and related materials, etc.
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